Metagenomics@Sea: a floating house in a marine environment

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Marine plastic litter is recently considered as a microbial vector in the marine environment and thereby seen as a new microbial aquatic niche: 'the plastisphere' (Zettler *et al.*, 2013). This new habitat can carry important species with positive or negative properties. The plastic may act as a floating transport vehicle for invasive microbial species, even for pathogenic bacteria, but also as a habitat for plastic-degrading micro-organisms. The interest for these microbial communities residing on plastic litter is growing. Previously reported studies focus especially on the question: which bacteria are present on the plastic debris and are these alien, invasive, pathogenic or beneficial? Two other major questions currently remain unanswered: what are they doing on the plastic and where did they come from? Investigating the microbial functions encoded in the bacterial genomes enables us to find potential beneficial bacteria or to prove pathogenicity. If important functions could be found however, it is still necessary to know the circumstances in which this microbial population was formed.

The study of the genetic material of a complex bacterial community present in a certain environment is called metagenomics. Making use of next generation DNA sequencing techniques makes it possible to compare the bacterial community of different habitats and the functions they can perform. One of the intensively studied niches is the marine environment. Marine microbial organisms are hard to cultivate and metagenomics provides a solution to study the microbial composition without cultivation. Although the classic marine environment like seawater and sediment has been studied in detail, information about the plastic-associated organisms identified by metagenomics is limited.

In this study the bacteria present on different plastic samples were identified using the 16S rDNA (V3-V4) amplicon sequencing technique. Three coastal areas of the Belgian part of the North Sea were sampled: Nieuwpoort, Oostende and Zeebrugge. The bacterial communities of the plastic samples were compared to the bacterial communities of their surrounding marine environment (seawater and sediment). Hereby not only the question: 'who is present', but also 'where did they come from' is investigated.

References

Zettler E.R., T.J. Mincer and L.A. Amarell-Zettler. 2013. Life in the 'plastisphere': microbial communities on plastic marine debris. Environmental Science and Technology 47:7137-7146.